

Science Module

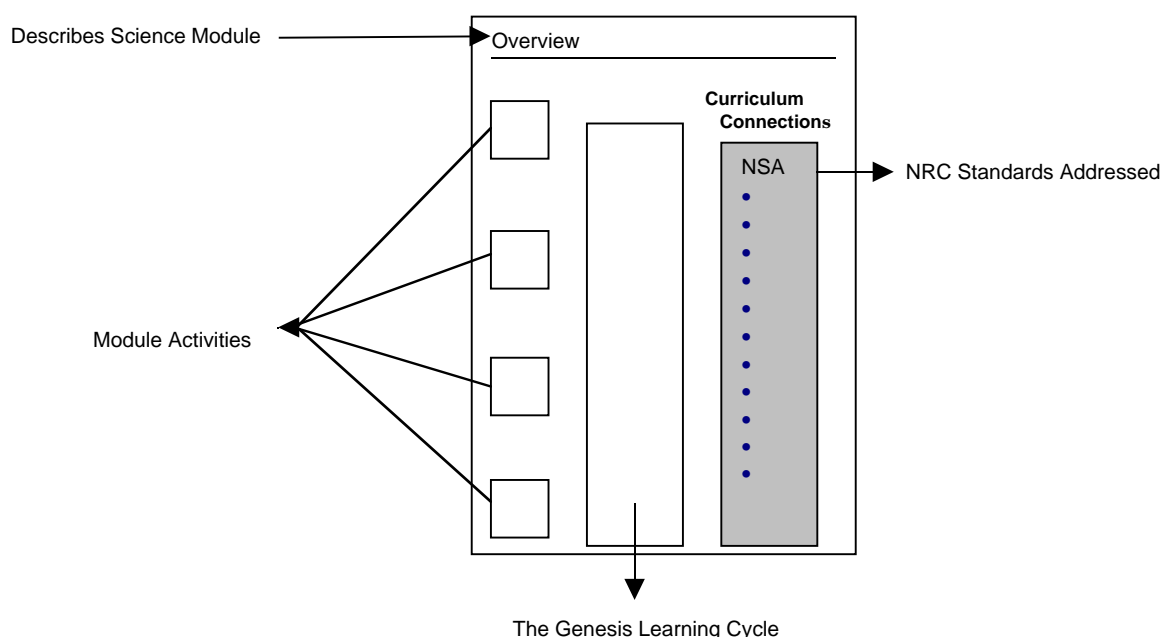
User's Guide

What is a Genesis science module?

Genesis science modules are extended units of instruction designed to replace or enhance traditional secondary school science curriculum units covering similar content material.

How does a Genesis science module work?

Each module takes students through a six-part learning cycle that parallels the process scientists and engineers use to understand the world or to solve problems. Each module contains an *Overview*, plus various *Student Text* materials, *Student Activities*, and *Teacher Guides* associated with each phase of the learning cycle.



Student Text materials introduce students to the module topic and provide information needed to promote understanding. Each text is two to four pages long and written at an appropriate readability level. Each Student Text contains explanatory static graphics and is prepared in blackline master format (pdf).

Each activity is written as a Student Activity and an accompanying Teacher Guide. Both are in blackline master format (pdf). The Student Activity pages contain the following sections, as appropriate: *Text*, *Problem*, *Procedure*, and *Conclusion*.

The Teacher Guide is a blueprint for a successful classroom unit of instruction. The Teacher Guide contains the following sections: *Background Information*, *Standards Addressed*, *Materials Needed*, *Procedure*, *Additional Learning Opportunities*, *Assessment Options*, and *Resources*.

How does the Genesis learning cycle work?

The learning cycle is a series of six phases in which the student experiences general introductory, interactive, explorational, didactic, and assessment processes in order to learn.

Briefing – Introduces multi-disciplinary modules emphasizing science and technology content.

Exploration – Introduces students to new ideas through activities, links these ideas to students' current understandings, and stimulates new questions that lead to learning. Activities may include reading, hands-on activities, discussions, manipulation of data, or exploration of resources.

Student Mission – Outlines module goals for the student. Expectations must be communicated clearly to the student.

Development – Instructs through experiments, observations, or reading and discussion of text. After data is recorded, interpreted, and conclusions are drawn, a relationship between evidence and decision-making is shown. Technical vocabulary may be introduced here. Students may use mathematics and computer tools in their work.

Interaction – Encourages interactions with peers or appropriate resource persons to accomplish a task. This phase of the cycle may include two types of communication:

- 1) Communication Design – students design methods for communicating observations, results, and conclusions to a target audience.
- 2) Debate – Students deliberate and consider opposing points of view. Discussions center around a given proposition regarding the Genesis mission or related science.

Additionally, it is recommended that students maintain a Laboratory Notebook. This can serve as a medium of communication between teacher and students, as well as an item for assessment.

Assessment – Allows students several options to demonstrate what they've learned. The goal is to determine student achievement relative to standards addressed in the module. Assessment items may be selected or constructed by the teacher.

How do I determine what part of my curriculum can be replaced with the Genesis science module? Will the module meet the standards required by my school? The Curriculum Connections section on the Overview indicates the areas of traditional curricula for which the module or particular activities can be substituted. These are categorized by the NRC standards that the module or activity addresses.

How do I get started?

- Read the Overview section of the module.
This section identifies the content and learning objectives that it covers.
- Print out the Student Texts, Student Activities, and Teacher Guides.
These materials are available for easy printing at the touch of a button.
- Determine which materials to use and sequence them for your course of study.
- Read the background information in the first Teacher Guide.
- Read the entire Student Activity and think about it from the students' perspective.
You know your students best. Where will they have difficulty? What modifications will you need to make to ensure their success?
If this is a hands-on activity, it is recommended that the teacher try the activity from start to finish in order to determine the availability of appropriate supplies and equipment, check the utility of materials substitutions, and make modifications to ensure student success.
- Hand out copies of the Student Activity and follow specific sections of the Teacher Guide.
- Assess student progress.
Assessment Options contains suggestions for formative and summative assessments.
- The Additional Learning Opportunities are applications of the content or added in-depth investigations. You are encouraged to use these with all students.
These optional activities are also appropriate for students who are motivated by the topic, need a different input mode, or must make up work in a non-class setting.

Safety Guidelines

Adopted from: Minimum Safety Guidelines for Presenters and Workshop Leaders—National Science Teachers Association.

1. Practice all demonstrations before presenting them.
2. Research and understand the properties of all chemical reactions.
3. Provide all materials necessary for handling any biohazard.
4. Have a fire extinguisher available whenever the slightest possibility of fire exists.
5. Provide for proper disposal for all reagents used in the demonstration.
6. Model the proper use of safety goggles.
7. Use safe quantities of materials. Keep hazardous materials to a minimum.
8. Do not overload ventilation systems. Do not use materials that release noxious fumes into the local air supply.
9. Replace chipped or cracked glassware. If glassware is to be heated, use Pyrex® or its equivalent.
10. Provide for shielding and eyewear for demonstrator and audience members when there is the slightest possibility of explosion or projectiles.
11. Lasers exceeding 1.0 mw should not be used in a demonstration. Provide for eye safety for all participants and audience members.
12. Properly secure all tanks of pressurized gases.
13. Obtain all necessary permits for firing model rockets or pyrotechnic devices.
14. Arrange for proper waste containers.
15. Dress appropriately for the demonstration, keeping in mind your safety as well as modeling safety for the audience.
16. Do not perform the demonstration if you are uncertain of any outcome or procedure. Do not hesitate to seek assistance. Satisfy the need for safety above that of any educational requisite.